Aspen

Quaking aspen: *Populus tremuloides*
Bigtooth aspen: *Populus grandidentata*

The **volume of aspen has decreased** steadily since 1983, probably as a result of natural forest succession. The number of saplings and poles has decreased since 1996, suggesting that volumes will continue to decrease in the future.

Both **mortality and removals of aspen are very high**. For instance, aspen makes up 12% of volume and growth in Wisconsin, but accounts for over 26% of total mortality and 23% of roundwood production. The **ratio of removals to growth is greater than 100%** which means that we are harvesting more aspen than is being replaced by growth.

More aspen is harvested than any other species group and is mainly used for pulpwood, composite products and sawlogs. Although there is plenty of aspen, the density of its wood is very low, which may make it a less valuable species for biofuel production.

- *How has the aspen resource changed?*
  Growing stock volume and diameter class distribution: 1983, 1996, and 2008
- *Where does aspen grow in Wisconsin?*
  Growing stock volume by region with map
- *How fast is aspen growing?*
  Average annual net growth by region and year: 1983, 1996, and 2008
- *How healthy is aspen in Wisconsin?*
  Average annual mortality by year: 1983, 1996, and 2008
- *How much aspen do we harvest?*
  Roundwood production by product and year: 1997, 2003, and 2006
- *How much is aspen selling for?*
  Prices for cordwood and sawtimber: 2000 to present
- *How much aspen biomass do we have?*
  Oven-dry tons by region of the state: 2008

"How has the aspen resource changed?"

Growing stock volume and diameter class distribution by year

The growing stock volume of aspen in 2008 was about 2.4 billion cft (Chart 1). This is a decrease of 9% since 1983 and 3% since 1996 (not statistically significant due to sampling error). Aspen accounts for 12% of total growing stock volume in the state.

The volume in large growing stock trees (over 13" dbh) has increased slightly since 1996 (Chart 2) but the volume of smaller trees has decreased.

The number of saplings and poles has decreased for both species (Chart 3), suggesting a decreasing role for aspen in future forests of Wisconsin.

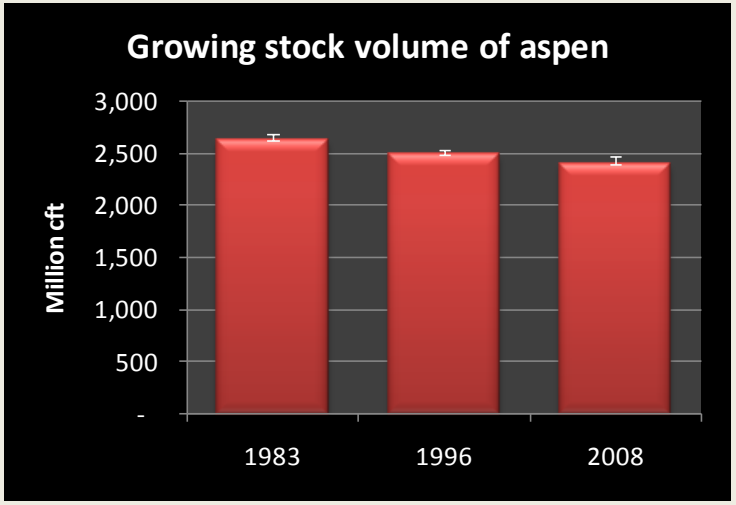


Chart 1. Growing stock volume (million cubic feet) by inventory year.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

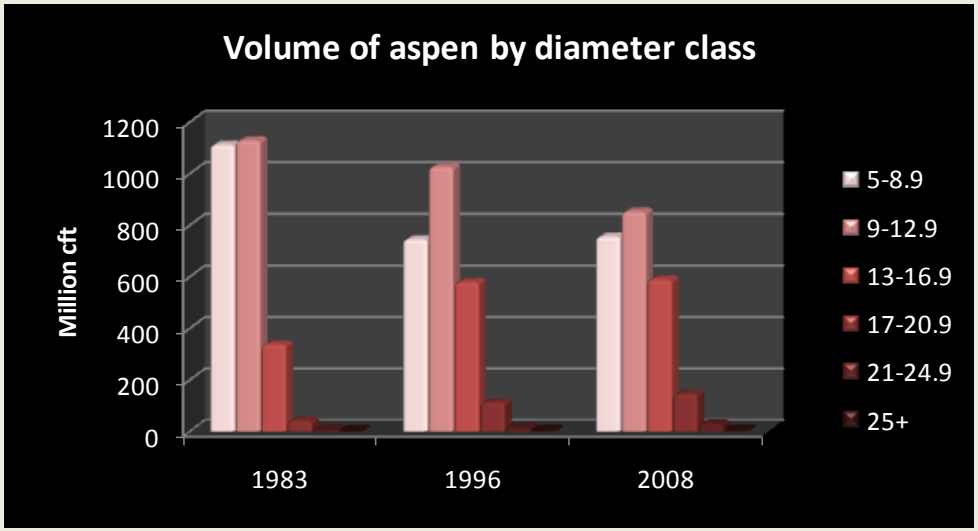


Chart 2. Growing stock volume (million cubic feet) in 1983, 1996, and 2008.
Source: USDA Forest Inventory and Analysis data: 1983, 1996, and 2008.

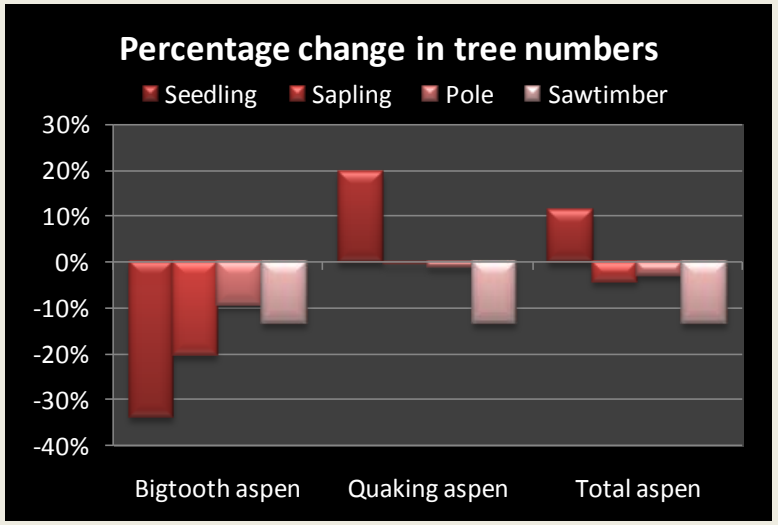
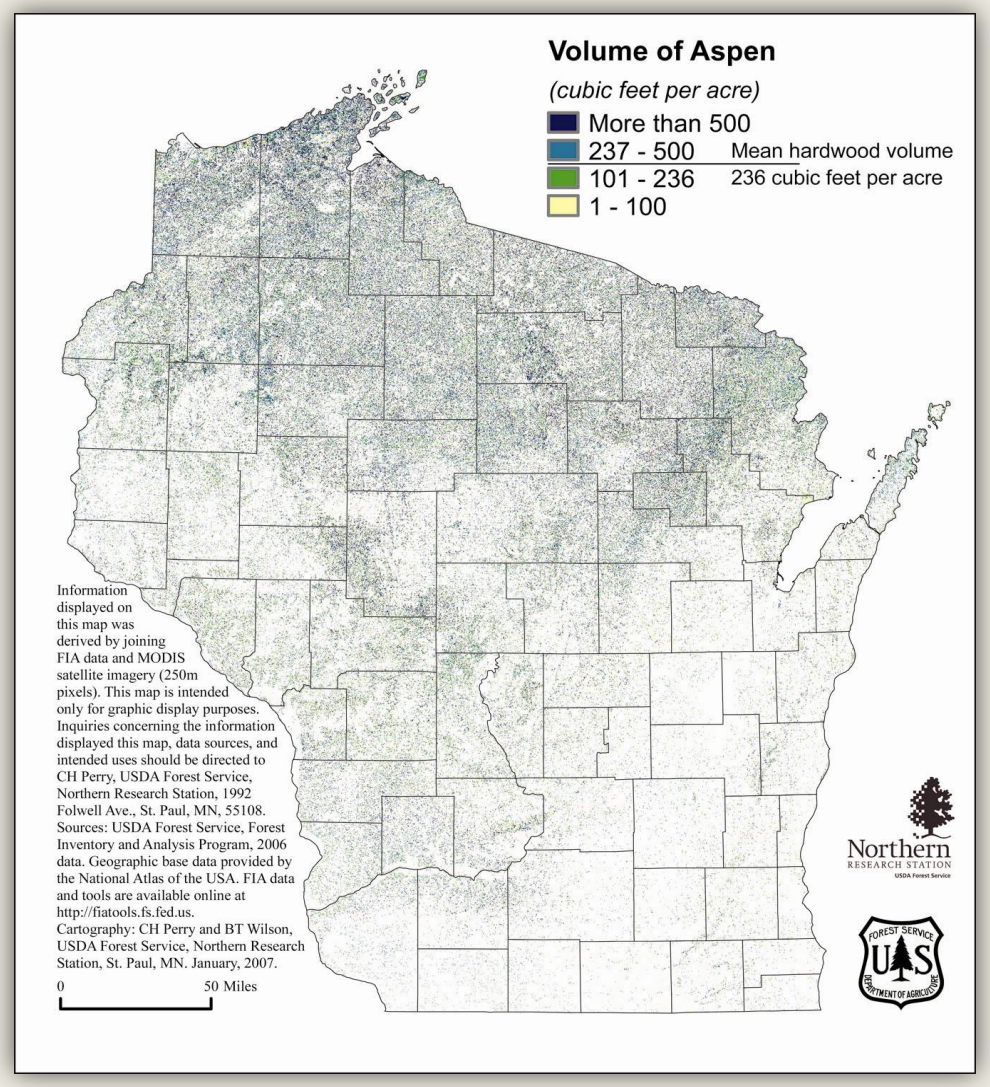


Chart 3. Percentage change in the number of live trees by size class between 1996 and 2008.
Source: USDA Forest Inventory and Analysis data: 1996, and 2008.

"Where does aspen grow in Wisconsin?"

Growing stock volume by region with map



About 74% of all aspen volume is located in northern Wisconsin with another 13% in the central part of the state.

Quaking aspen accounts for 71% of all aspen volume and over 80% of this species occurs in northern Wisconsin.

Bigtooth aspen which makes up the remaining 30% of volume, is more evenly distributed. About 40% of the volume of this species occurs in the southwest and central parts of the state.

Table 1. Growing stock volume (million cft) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total	Percent of total
Bigtooth Aspen	117	161	245	32	151	707	**29%**
Quaking Aspen	200	582	781	63	67	1,693	**71%**
Total	317	743	1,026	95	218	2,400	**100%**
Percent of total	**13%**	**31%**	**43%**	**4%**	**9%**	**100%**	

Source: USDA Forest Service, Forest Inventory and Analysis 2008 data

Additional tables:

Volume by county in 2008 (pdf; Excel)

"How fast is aspen growing?"

Average annual net growth by region and year

The annual net growth rate of aspen has declined 9% since 1983 but remained statistically unchanged for the last 12 years (Chart 4). From 2004 to 2008, growth was about 70 million cubic feet per year or 11.9% of total volume growth in the state.

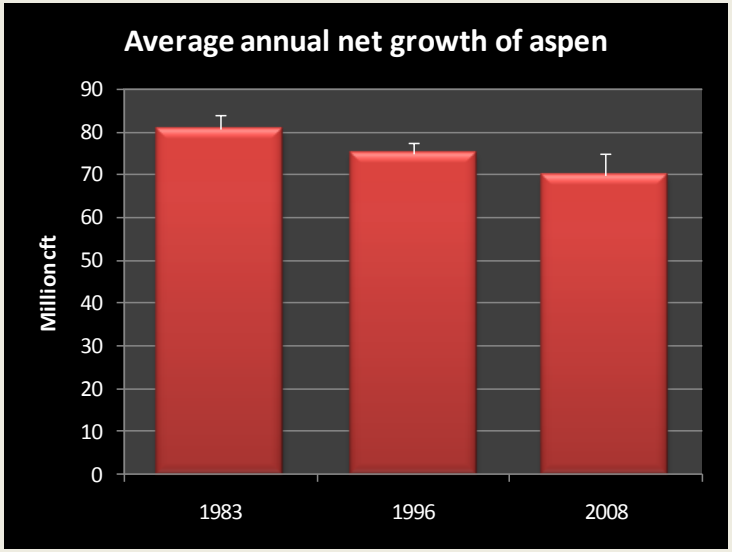


Chart 4. Average annual net growth (million cubic feet) from 2004 to 2008.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2008

Table 2. Average annual net growth (million cft/year) and ratio of growth to volume by region of the state.

Region	Net growth	Percent of Total	Ratio of growth to volume
Central	6.5	9%	2.1%
Northeast	25.1	36%	3.4%
Northwest	30.6	44%	3.0%
Southeast	2.6	4%	2.8%
Southwest	5.1	7%	2.3%
Statewide	**69.9**	**100%**	**2.9%**

Source: USDA Forest Inventory and Analysis 2008.

The highest volume growth for aspen, as well as the highest rate of growth is in the northern part of the state (Table 2).

The average ratio of growth to volume for aspen is 2.9%, the same as the statewide average of 2.8% for all species.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How healthy is aspen in Wisconsin?"

Average annual mortality by year

Average annual mortality for aspen is 54 million cft or 26.4% of total mortality in the state (Chart 5). This rate has remained statistically unchanged for the past 23 years.

The ratio of mortality to gross growth is about 44% for aspen (Table 3). The average for all species in Wisconsin is 26% indicating that **aspen has a much higher ratio of mortality to growth** than average. The ratio for quaking aspen is 11% higher than for bigtooth aspen.

Whereas aspen accounts for approximately 12% of total volume and growth statewide, these two species make up 26% of total mortality.

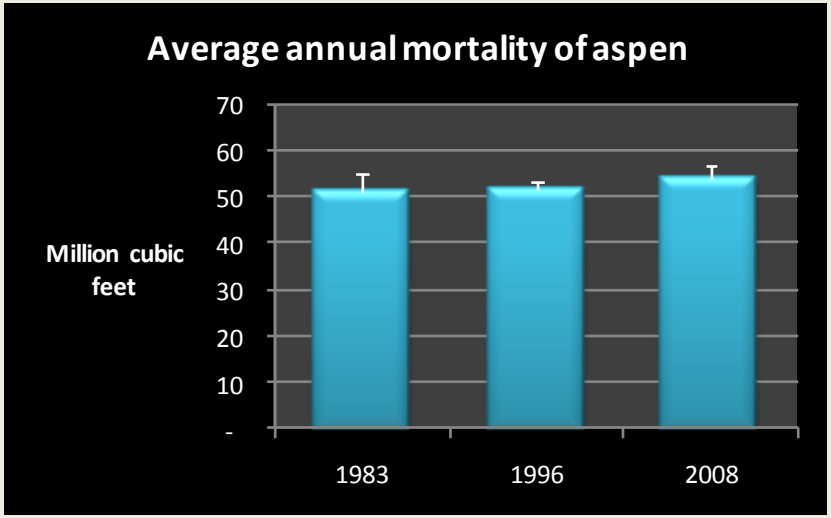


Chart 5. Average annual mortality (million cubic feet) by inventory year.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2008

Table 3. Mortality, gross growth, and the ratio of mortality to gross growth by species of aspen.

Species	Average annual mortality (cft)	Average annual gross growth (cft)	Mortality / growth
Bigtooth Aspen	11,823,431	33,252,900	**36%**
Quaking Aspen	42,202,077	90,669,750	**47%**
Total Aspen	**54,025,508**	**123,922,650**	**44%**

Source: USDA Forest Inventory & Analysis data: 2008

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much aspen do we harvest?"

Roundwood production by product and year

In 2003, Wisconsin produced about 94 million cft of aspen roundwood (Chart 6), a decrease of about 17% since 1997. Aspen, at that time, accounted for almost a quarter of all roundwood production.

In 2006, aspen produced about 26% of all pulpwood in the state, a decrease of 7% since 2003. Aspen also accounted for 75% of all composite products in 2006.

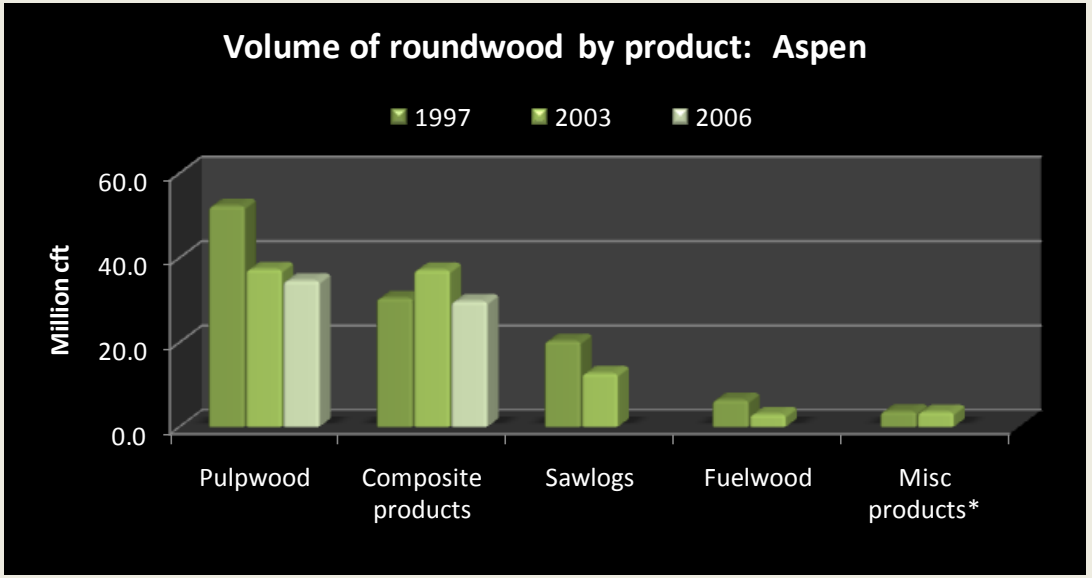


Chart 6. Volume of roundwood products. Numbers for pulpwood and composite products are from 2006. Numbers for sawlogs, fuelwood and miscellaneous products are from 2003 (Ron Piva).
* Miscellaneous products include poles, posts, pilings and veneer.
Source: Timber Products Output Mapmaker, http://ncrs2.fs.fed.us/4801/fiadb/rpa_tpo/wc_rpa_tpo.ASP

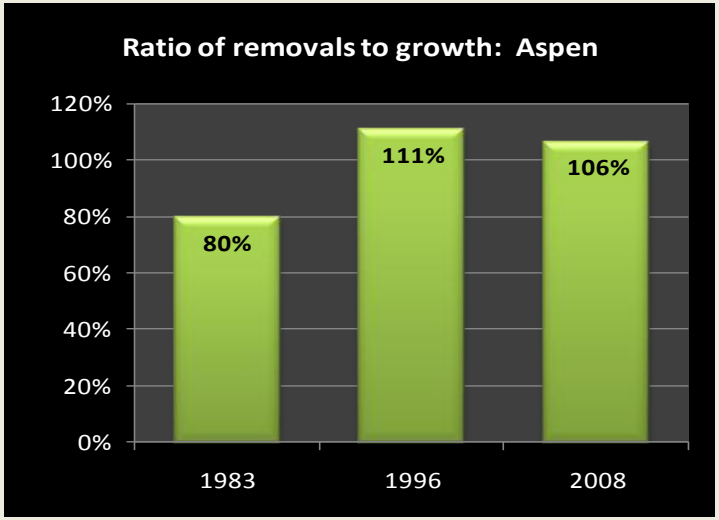


Chart 7. Ratio of volume harvested annually to net growth.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, 2008.

The ratio of aspen removals to growth has been greater than 100% since 1996 (Chart 7). This is much higher than the average ratio of 56% for all species. A ratio over 100% means that the amount of wood harvested exceeds the amount of new growth, although sampling error may alter this assumption somewhat.

Additional tables:
Average annual growth, mortality and removals by region (Pdf, Excel).

"How much is aspen selling for?"

Prices for cordwood and sawtimber: 2000 to present

Due to the variability of timber prices from year to year and region to region, two methods of reporting prices are presented here: **Timber Mart North** and the **weighted average stumpage prices** from Wisconsin Administrative Code Chapter NR 46.

Delivered prices for pulpwood and sawtimber, as reported in the Timber Mart North (Chart 8), have increased slightly since 2000 whereas the price for stumpage pulpwood has decreased 22% since 2000.

Aspen cordwood and log prices, according to NR46 (Table 4), peaked in 2006 and have fallen since. Log prices are substantially below average for hardwoods.

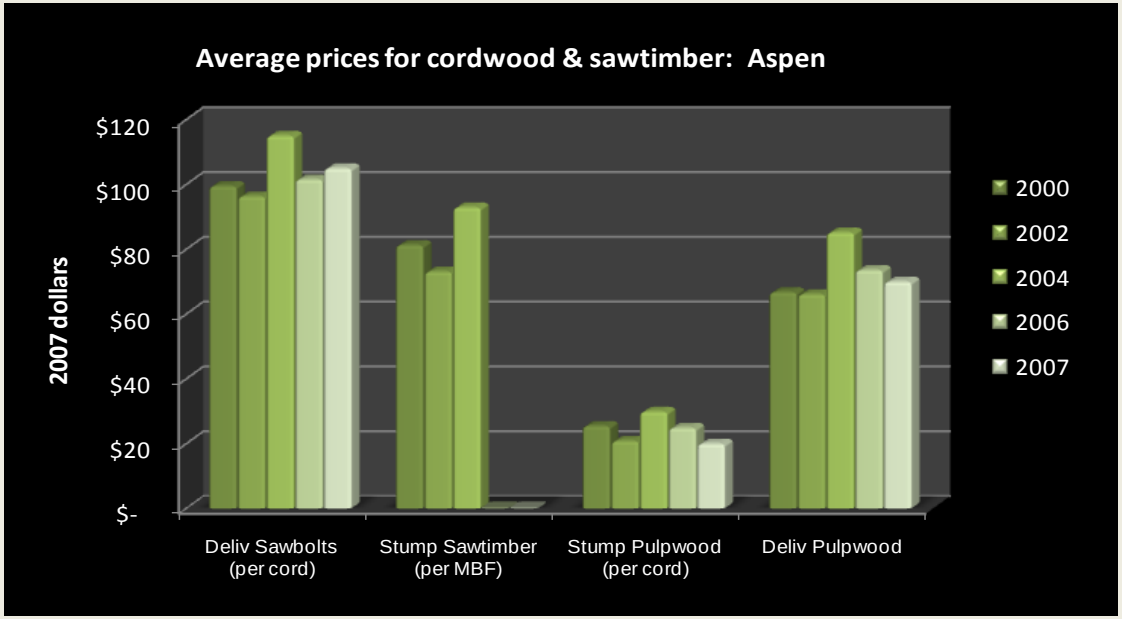
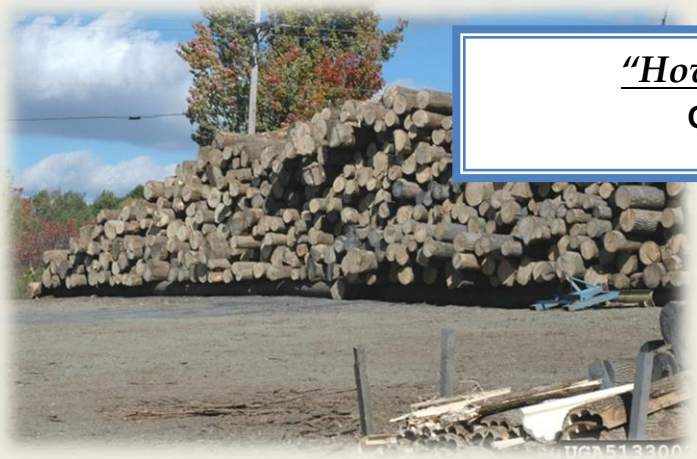


Chart 8. Average prices for cordwood and sawtimber (2007).
Source: Timber Mart North, George Banzhaf & Company, 8301 N. Allen Lane, Milwaukee, WI 53217

Table 4. Average weighted stumpage prices (adjusted for inflation to 2009 dollars) by year for Wisconsin.

Product	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average for all hardwoods 2008
Cordwood (per cord)	$30	$31	$32	$32	$37	$50	$57	$39	$20	**$22**	$19
Logs (per MBF)	$71	$68	$51	$46	$76	$76	$131	$69	$70	**$57**	$140

Source: Wisconsin Administrative Code Chapter NR46, 2000 to 2009



"How much aspen biomass do we have?"

Oven-dry tons by region of the state

There were 57.5 million oven-dry tons (ODT) of aspen biomass in 2008, a decrease of 6 million ODT or 19%, from 1983. This represents 9.7% of total biomass statewide. As with volume, most aspen is located in northern Wisconsin (Chart 9).

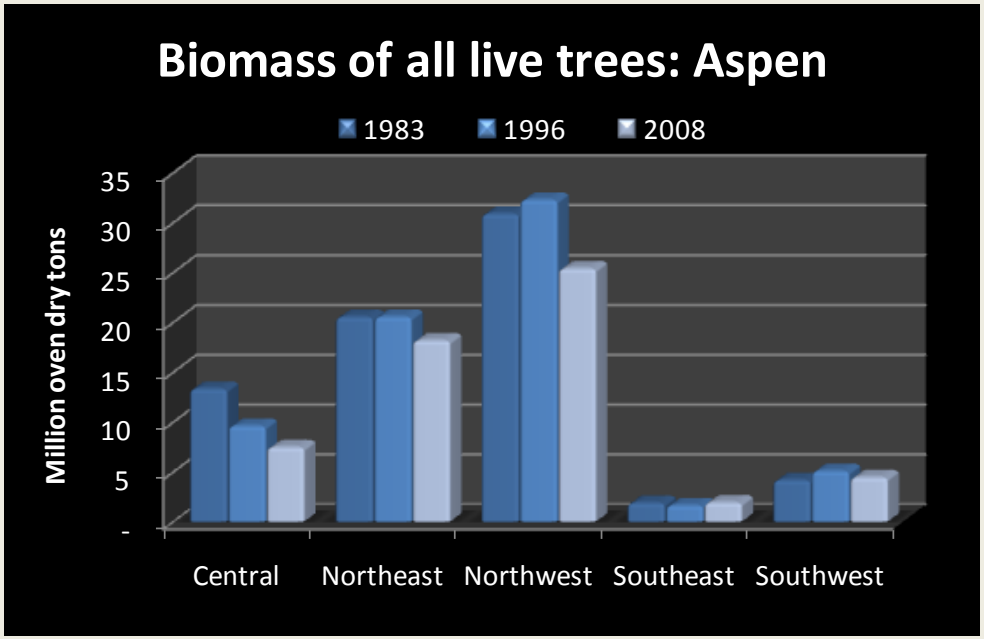


Chart 9. Biomass (million oven-dry tons) by year and region.
Source: USDA Forest Inventory & Analysis data: 1983, 1996, and 2008

Aspen has the second lowest density of all hardwood species in Wisconsin, with a ratio of biomass to volume of 38.4 oven-dry pounds per cubic foot (ODP/cft). The average for all hardwoods is 50.1 ODP/cft and for all trees is 46.8 ODP/cft. Approximately, 74% of all biomass is located in the stem and 20% in the top branches.

Additional tables:

Biomass by county in 2008 (pdf; Excel)